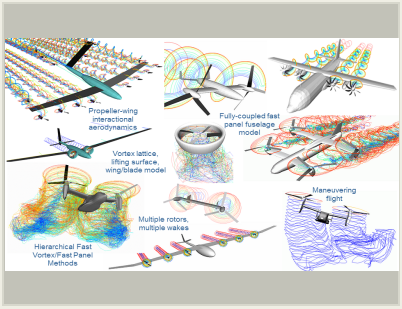
Small Business Innovation Research/Small Business Tech Transfer

Distributed Electric Propulsion Aircraft Comprehensive Analysis and Design Tool, Phase I

Completed Technology Project (2017 - 2018)

Project Introduction

The solicitation seeks innovative approaches in designing and analyzing Distributed Electric Propulsion (DEP) aircraft to support ARMD's Strategic Thrust #3 (Ultra-Efficient Commercial Vehicles) and #4 (Transition to Low-Carbon Propulsion). This proposal seeks to address this need by developing DEP aircraft analysis tools able to accurately predict and optimize aerodynamic and aeroelastic performance, loads, flight dynamics and acoustics of DEP aircraft in computational times commensurate with daily design work. The proposed approach is to leverage and enhance existing V/STOL aircraft analysis and flight simulation software with new capabilities that address current gaps in technology identified by NASA in this solicitation and developers of DEP aircraft. The new comprehensive DEP aircraft analysis will be built in a modular fashion, coupling flight simulation, aeromechanics and acoustics components into a single tool but with an eye toward implementing each transportable software library within alternate analyses and optimization tools, such as NASA's Multidisciplinary Design, Analysis and Optimization (MDAO) platform. In Phase I, a prototype DEP aircraft comprehensive analysis will be created and validated for accurate, fast prediction of DEP-related aeromechanics phenomena. A modular form of the new analysis will be coupled with a flight simulation enhanced to support additional control options available to DEP aircraft like variable RPM and thrust vectoring. Automated coupling with an acoustic prediction code will provide DEP aircraft acoustic characteristics for both steady and maneuvering flight. A model of NASA's SCEPTOR X-Plane will be constructed and demonstration calculations performed predicting flight dynamics, acoustics, aerodynamics and aeroelasticity. Phase II will see the implementation of further enhancements and completion of commercial software ready for use by government and industry.



Distributed Electric Propulsion Aircraft Comprehensive Analysis and Design Tool, Phase I Briefing Chart Image

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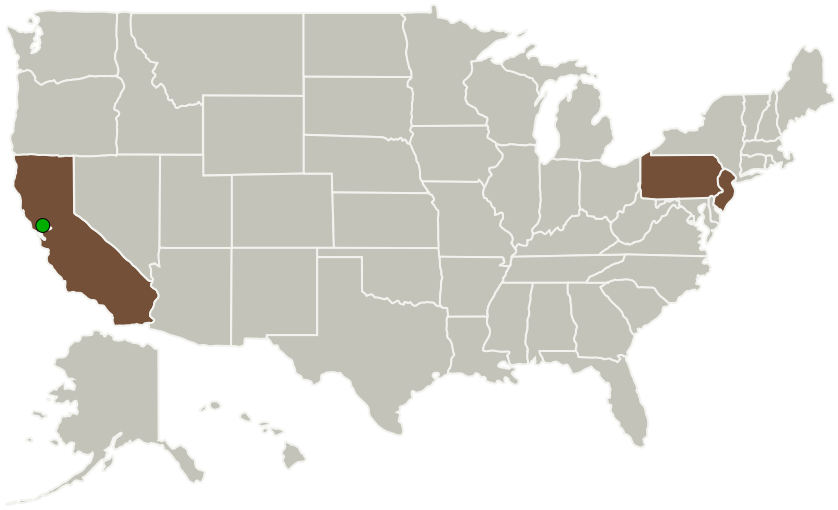
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Continuum Dynamics, Inc.	Lead Organization	Industry	Ewing, New Jersey
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	New Jersey
Pennsylvania	

Project Transitions

June 2017: Project Start

June 2018: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140848)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Continuum Dynamics, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

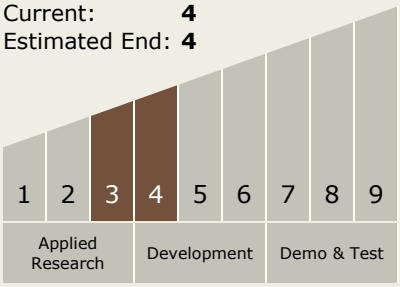
Carlos Torrez

Principal Investigator:

Daniel A Wachspress

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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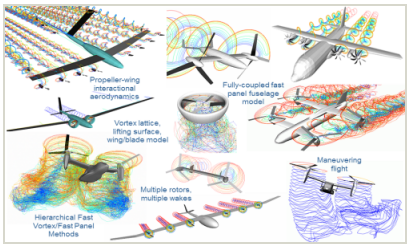
Images



Briefing Chart Image
Distributed Electric Propulsion Aircraft Comprehensive Analysis and Design Tool, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/134263)

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.6 Advanced Atmospheric Flight Vehicles

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System